PROCEEDINGS

OF THE

AMERICAN PHILOSOPHICAL SOCIETY.

VOL. I. MAY, JUNE & JULY, 1840. No. 12.

Stated Meeting, May 1.

Present, twenty-one members.

Mr. DU PONCEAU, President, in the Chair.

Mr. Vaughan, on presenting a transfer of page 524 of Schaaf's Syriac Lexicon (Leyden edition, 1717), &c., by Mr. Joseph Dixon, of Taunton, Massachusetts, on the plan of the transfer process of Mr. Dixon's invention, read sundry extracts of letters from him on the subject.

A notice of this invention was first published in the Salem Gazette, by the editor of that paper, on the 25th day of May, 1832; but the inventor has not yet made the process public.

The Committee, consisting of Mr. Walker, Dr. Patterson, and Mr. Bache, to whom was referred a paper, entitled "Observations on Nebulæ, with a Fourteen Feet Reflector, by H. L. Smith and E. P. Mason, during the year 1839, by E. P. Mason," reported in favour of publication in the Society's Transactions, which was directed accordingly.

The object of Messrs. Smith and Mason was to furnish a minute description of some of the principal nebulæ in the heavens, in order that future changes in their appearance, should any occur, may be detected. The process employed was—1st. To prepare an accurate chart of all the stars in and about the nebula, capable of micrometrical measurement. 2dly. To fill in with the smaller stars down to the *minimum visibile*, by estimation. 3dly. To lay down the nebula on this chart with such care and precision, that the errors of its delinea-

tion may not far exceed those of original vision. The author, Mr. Mason, states at length the expedients used to effect the latter purpose, viz.,—the drawing of *lines of equal brightness*, as a guide to the engraver; the examination of each portion of the nebula by several persons; and, lastly, the repeated comparison of the drawings with the original, on successive evenings, till no further improvement seemed to be practicable.

The telescope used by Messrs. Smith and Mason, was of their own construction. It was 14 feet in length, and had 12 inches clear aperture, being a Herschelian, mounted somewhat rudely on the plan of Mr. Ramage. The difficulties experienced by Messrs. Smith and Mason, as amateur artists, in casting and polishing specula at New Haven, are stated in detail. The telescope was capable of separating ζ Orionis, μ^2 Bootis, γ Virginis in 1838, λ Ophiuchi, and others of a distance of less than 1″. For such purposes, however, the use of diaphragms was necessary, owing to an imperfection of the casting, and the full light of the telescope could not be employed. This circumstance directed their attention to the subject of this paper.

A cursory examination of the principal nebulæ described, and, in some instances, figured by the Herschels, pointed out discrepancies between their descriptions and present appearances, which must be attributed either to a change in the nebulæ themselves, or to the want of sufficient minuteness of examination on the part of the Herschels, whose object was rather the formation of a complete catalogue of the nebulæ in the heavens, than the full and perfect description of any of the individuals. Thus, the paper contains a drawing of the "nebula trifida," *h.* 1991: the triple star does not occupy the same position in the cleft as given in the figure in Sir J. F. W. Herschel's paper, Phil. Trans. 1833, but rather adheres to the left of the three divisions; and what is more remarkable, the small star about 30′ north of this triple star was surrounded with a nebula not much inferior in size and brilliancy to the "nebula trifida." A drawing is also furnished of the nebula, *h.* 2008 (the shape of which resembles the capital Greek Ω), with a critical examination of Herschel's figure of the same.

The most remarkable discovery of Messrs. Smith and Mason, was that of the junction of the two nebulæ, *h.* 2092 and 2093. These great nebulæ, or "milky ways," are described on several occasions by the elder Herschel, and are also described and figured by the

younger. They are distant about two-thirds of a degree from each other. Messrs. Smith and Mason, however, distinctly saw the nebulous matter extending from one to the other, making the whole one conspicuous nebula of more than a degree in length, being among the most remarkable in the heavens, and inferior only to the great nebulæ of Orion and Andromeda.

Mr. Mason remarks, that it is difficult to conceive how the companion of the *nebula trifida*, and the junction of the two last mentioned, should have been overlooked by such observers as the Herschels, with instruments so far superior to his in optical capacity. The supposition that the nebulous space, noticed by Messrs. Smith and Mason, was not brought under the immediate inspection of the Herschels, seemed inadmissible. That the greater clearness of the atmosphere of New Haven should more than compensate for the inferior light of the telescope employed was hardly probable; the only remaining supposition was, that the nebulous matter, in the space examined by all these observers, has recently undergone a change in shape and brilliancy.

In making the chart of the stars to which the nebulous space is referred, Mr. Mason used the ten feet Dollond refractor, of five inches aperture, belonging to the Philosophical Department of Yale College, with a Dollond's illuminated line micrometer. With this he has determined the relative position of the stars down to the 16th magnitude, by repeated observations, and has furnished a catalogue of the correct places of 15 stars in the first chart, 30 in the second, and 182 in the third.

Dr. Dunglison stated that the horse, with the filaria in the aqueous humour of the eye, to which allusion was made at the last meeting (see Proceedings, p. 200), was in the city, and that he had had an opportunity of verifying the statement then made. Dr. Dunglison referred to several similar cases,—most of the observers believing the entozoon to be a filaria papillosa, but some a lesser strongylus.

Dr. Hays referred to cases of entozoa found not only in the eye, but in other parts of the body, and alluded briefly to the practicability of the germs being received from without.

Dr. Chapman, as chairman of the Committee to collect do-

cuments connected with the political and historical state of the country, reported that he would be able to procure for the Society the Correspondence of Robert Morris. He farther stated his expectation to be able to present important documents from Virginia, calculated to throw valuable light on the history of the colony and the country.

Mr. Vaughan reported the death of Mr. William Maclure, a member of the Society, who died in Mexico on the 23d of March last.

Dr. Dunglison, Reporter, presented No. 11 of the printed Bulletin.

Stated Meeting, May 15.

Present, twenty-six members.

Mr. Du Ponceau, President, in the Chair.

The following donations were received:

FOR THE CABINET.

A Plaster Bust of Alexander Hamilton.—*From Mrs. Astley.*

Specimens of Crystallized Carbonate of Lime and Pipe Iron Ore; found at the Iron Works of William Reed, Perrysville, Mifflin County, and by him deposited at the Bank of the United States, with N. Biddle, Esq.—*From Mr. Dunlap, with the assent of Mr. Biddle.*

Two Daguerreotype Portraits, the one of Mr. Du Ponceau, the other of Mr. Vaughan, taken by Mr. Cornelius.—*From Dr. Goddard.*

The Committee to whom was referred the paper of Dr. Hare, entitled "Engraving and description of an apparatus and process for the rapid congelation of water," &c., reported in favour of its publication in the Society's Transactions, which was ordered accordingly.

A communication was read from Professor Bonnycastle, of the University of Virginia, entitled "On the insufficiency of Taylor's Theorem, as commonly investigated, with objections to the demonstrations of Poisson and Cauchy, and the as-

sumed generalization of Mr. Peacock, to which is added a new investigation, and remarks on the development and continuity of functions;" which was referred to a Committee.

Mr. Lea read a paper, entitled "Notice of the Oolitic Formation in America, with descriptions of some of its organic remains, by Isaac Lea;" which was referred to a Committee.

A communication was read from Prof. Locke, of Cincinnati, the objects of which are, "1. To determine more accurately the relation, magnetic dip and intensity at Cincinnati, and at Louisville, Ky., by making observations as near together, in point of time, as possible. 2. To determine the horary changes of horizontal intensity at Cincinnati, and 3. To ascertain more accurately the effect of changes of temperature on the needles used by the author, and to deduce a constant coefficient for each of them." The paper was referred to the same Committee to whom Professor Locke's previous paper on the same subject was referred (Proceedings of March 6, 1840).

Mr. Du Ponceau made a verbal communication on the subject of the silk culture in India.

It appears from the sixth volume of the Transactions of the Agricultural and Horticultural Society of India, Calcutta, 1839, which is in the library of the Society, that the English are extending the culture of silk to the Deccan and the Western Coast of India, and have an establishment for that purpose, under the direction of Signor Mutti, an Italian gentleman, who resides at Bombay, and is styled "Superintendent of the Silk Culture in the Deccan." Two letters addressed by him to John Bell, Esq., Secretary of the Agricultural Society of India, Mr. Du Ponceau considered to be worthy of the attention of those who feel an interest in the promotion of the silk culture in this country. A treatise by that gentleman on the various branches of the silk culture, is subjoined to, and published with, his letters. The chapter or division concerning the art or method of reeling or winding silk from the cocoons, Mr. Du Ponceau regards as replete with valuable practical instruction.

On this last subject (the art of reeling), the correspondent at Paris of the National Intelligencer asserts, that an excellent treatise has

been lately published, in that capital, by M. Ferrier, which has been republished in the third volume of the Annals of the Sericole Society, specially instituted for the promotion of the culture of silk in France.

As instruction is much wanted in this country, on this particular subject, while the culture of silk engages the general attention, Mr. Du Ponceau expressed a hope that M. Ferrier's treatise would be translated and published for the benefit of his fellow-citizens.

Mr. Du Ponceau farther stated, that from the volume of Transactions above cited, it appears that the English are making great exertions to introduce the culture of cotton into India. Specimens of the best soils for growing cotton in this country, particularly those of Georgia, have been sent to the Agricultural and Horticultural Society, and analyzed by them. The descriptions accompanying the specimens have not been found sufficiently particular, nor have their analyses yet led to any decided conclusions. They seem to think, that the abundance and fineness of good cotton depend on the quantity of *carbon* in the soil, *and the solubility of that carbon*. But with this theory they do not appear to be entirely satisfied. They find that all the American, the Mauritius, and the best Singapore soils, producing the finest cotton, contain a considerable percentage of vegetable matter under the form of peat or lignite, in a state of exceedingly minute division, and in many of them some part of it is readily soluble in cold water. They find again, that the Indian soils contain very little vegetable matter, and this wholly insoluble in water, but that the best contain a far larger proportion of carbonate of lime, and some of them the iron in a different state from the others. It would seem, however, that the plant is somewhat indifferent about the iron; yet, as it is not known what part the iron plays in soils (which may influence their electricity as well as their tenacity and relations to moisture), they consider it a matter to be borne in mind and to be subjected to farther inquiries.

The culture of the vine in India, Mr. Du Ponceau added, appears also to engage much of the attention of the Society; and, on the whole, the useful arts and sciences seem to be cultivated in that country to a degree which deserves to be particularly noticed.

Mr. Walker stated the results of Professor Loomis's farther observations on the subject of Galle's second comet, which Prof. L. intends hereafter to lay before the Society.

He further stated that Galle had discovered a third comet, which was of great interest to the astronomer; as it was likely to add another to the number of comets of known period.

Mr. Walker mentioned the receipt of European observations of Galle's second comet, as late as the 21st of February, and those of Prof. Loomis of the 18th and 19th of March. From these, he had selected the observations made January 25th and February 21st, at the Berlin Observatory, and that of Prof. Loomis at the Hudson Observatory, on the 19th of March; and had computed the elements of its orbit.

The comet's observed geocentric longitude and latitude, cleared of aberration and parallax, and referred to the mean equinox of January, 1840, were as follows:

M. T. Berlin.	*Longitude.*			*Latitude.*		
25.^{d}49021	2°	57′	26.8″	+75°	9′	42.1″
52. 47442	28	44	0.6	+33	42	26.1
79. 59679	35	47	34.8	+ 9	22	20.4

from which he had obtained for the elements of the comet:

Perihelion Pass. March 13.^{d}07523 Berlin mean time.

☊	236°	49′	8.0″
ι	59	15	8.9
π	80	14	52.8

log. q 0.086798

Motion retrograde.

Dr. Dunglison gave the particulars of a case, in which blood that flowed, on dissection, from the arteries of the brain, coagulated fifteen hours after the death of the individual.

The patient died after a severe agony, and after an illness of some duration, for which mercury had been administered so as to affect the system freely. On opening the head, the arteries of the brain were found turgid with blood; and on removing the brain, the blood flowed from them and coagulated.

Dr. Dunglison made some remarks on the singularity of this phenomenon, and its relations to physiology and medical jurisprudence, and stated that it completely overthrew the views of those, who believe that the blood is either possessed of a vital influence, or receives

some influence from the living vessels that contain it, which maintains its fluidity, and that so soon as it is removed from these influences it coagulates or dies. In this case the blood remained fluid, and coagulation took place fifteen hours after the total cessation of respiration and circulation, and after the blood had become cold; circumstances showing that the phenomenon is wholly physical in its nature.

Mr. Vaughan reported the death of Benjamin Allen, LL.D., a member of the Society, who died on the 20th of July, 1836, aged 64 years.

On motion of Mr. Vaughan, it was Resolved, That Prince Maximilian of Neuwied should be presented with the volumes of the Transactions of the Society since the fourth volume.

Mr. Vaughan further stated, that Prince Maximilian had intimated his intention of presenting to the Society a copy of his Voyage to America, with accompanying Atlas, &c.

The Librarian, in accordance with a resolution of the Society,* presented, for approval, a list of Societies to whom it is proposed to send the Proceedings of the Society.

* The resolutions, adopted at a recent meeting (April 3d, 1840), for the distribution of the Society's Proceedings, are as follows:

First. Twenty copies to be furnished to the Librarian to be retained in the Library.

Secondly. A copy to be sent regularly

a. To members qualified to vote at elections, and to such other members as the Secretaries may think proper.

b. To each of the Societies in correspondence with this Society.

c. To the Editors of such Scientific Journals of the United States and of foreign countries as may be determined upon by the Secretaries.

d. To each subscriber to the Transactions of the Society, not otherwise entitled to a copy.

Thirdly. A copy of the number of the Bulletin, in which their communications are noticed, to be sent to correspondents, not members of the Society.

Fourthly. Any person to be permitted to subscribe for the year, with the Librarian, at such annual subscription price as shall be affixed by the Secretaries.

Fifthly. It shall be the duty of the Librarian to transmit regularly, and as early after the date of publication as practicable, the copies for the various Societies, at home and abroad, which copies shall be furnished him by the Secretaries, duly enveloped, according to a list sanctioned by the Society.

Sixthly. It shall be the duty of the Secretaries to attend to the conservation and distribution of the remainder, as above directed, and they shall be authorized to take such measures for this purpose as they may deem expedient.

The following list was sanctioned :

UNITED STATES.

Albany, Institute.
Boston, Bowditch Library.
,, Academy of Sciences.
,, Historical Society of Massachusetts.
,, Athenæum.
,, Society of Natural History.
,, Statistical Society.
Cambridge, Library of Harvard University.
Georgia Historical Society.
Harrisburg, Library of State of Pennsylvania.
Hartford, Society of Natural History.
,, Historical Society.
Philadelphia, Academy of Natural Sciences.
,, Athenæum.
,, Franklin Institute.
Providence, Rhode Island Historical Society.
Washington City, Library of Congress.
Worcester, Antiquarian Society.

EUROPE.—1. *Great Britain.*

Bath, Bath and West of England Society.
Cambridge, Philosophical Society.
Dublin, Royal Irish Academy.
,, Dublin Society.
Edinburgh Royal Society.
,, Society of Antiquaries.
London, Royal Society.
,, Astronomical Society.
,, Greenwich Observatory.
,, Horticultural Society.
,, Society of Arts, Manufactures and Commerce.
London, Geological Society.
,, Zoological Society.
,, Linnæan Society.
,, Royal Geographical Society.
,, Royal Asiatic Society.
,, Antiquarian Society.
,, London Institution.
,, Royal Institution.
,, British Association.
Manchester, Literary and Philosophical Society.
Penzance, Royal Cornwall Geological Society.

2. *Continent.*

Amsterdam, Netherlands Institute.
Haarlem, Hollandish Society of Sciences.
Rotterdam, Batavian Society of Sciences.
Brussels, Royal Academy of Sciences and Belles-Lettres.
Berlin, Royal Academy of Sciences.
Copenhagen, Royal Academy of Sciences.
Gottingen, Royal Academy of Sciences.
Lisbon, Royal Academy of Sciences.
Madrid, Royal Academy of History.
Moscow, Imperial Society of Natural History.
St. Petersburg, Imperial Academy of Sciences.
Paris, Institute and Royal Academy of Sciences.
,, School of Mines.
,, Royal Asiatic Society.
,, Museum of Natural History.
,, Society of Antiquaries.
,, Geographical Society.
Pesth, Hungarian Academy of Sciences.
Stockholm, Royal Academy of Sciences.
Turin, Royal Academy of Sciences.
Upsal, Royal Academy of Sciences.

INDIA.

Calcutta, Asiatic Society of Bengal.
Calcutta, Horticultural and Agricultural Society.

Stated Meeting, June 19.

Present, twenty-four members.

Mr. Du Ponceau, President, in the Chair.

The following donations were received:

FOR THE CABINET.

Several Stones, worked by the Indians with Stone Hammers, found in an Indian workshop, five miles from Paradise, near Lancaster, Pennsylvania.—*From Mr. Redmond Conyngham.*

The Committee, consisting of Mr. Taylor, Mr. Booth, and Dr. Hays, to whom was referred a Communication, entitled "Notice of the Oolitic Formation in America, with Descriptions of some of its Organic Remains, by Isaac Lea," reported in favour of publication, which was ordered accordingly.

In this paper Mr. Lea describes a number of fossils from New Granada and Cuba, which he considers to belong properly to the forms resembling those well known to exist in the Oolites (Jura formation) of Europe. In a note Mr. Lea mentions, that after his paper was written, the work of the distinguished geologist, Von Buch, was received by him from the author. In this work, Von Buch describes and figures some of the fossils from the same formation in New Granada, taken by Humboldt nearly forty years since to Europe, which that learned traveller, in his "Essay on the Superposition of Rocks," considered to belong to the Jura Formation. Von Buch takes a different view, and places them higher up in the series; that is, in the Chalk Formation. After a careful perusal of Von Buch's work, and a re-examination of the specimens, Mr. Lea still holds to his previous opinion, that these forms belong properly to the Oolitic series, and not to the Chalk. He is the more confirmed in this opinion from having since been enabled to examine Captain Grant's Memoir on the Geology of Cutch, recently published in the Geological Society's Transactions of London, Second Series, Vol. V. Part 2; where the forms represented have a strong alliance to those described by Mr. Lea. Captain Grant states, that the mineralogical character of the rock "greatly resembles the English Lias; but its fossils have been found, after a careful examination by Mr.

James Sowerby, to assimilate very closely to those of the Oolitic beds," &c.

Mr. Lea's paper contains descriptions of the following species:

Orthocera Humboldtiana. Testâ rectâ, elongato-conicâ, subcylindraceâ; articulis transversis, subdistantibus.

Ammonites Tocaimaensis. Testâ orbiculari; anfractibus planulatis, transversim costulatis; costis planulatis; peripheriâ minutè sulcatâ.

Ammonites Occidentalis. Testâ orbiculari, utrinque umbilicatâ; anfractibus rotundatis, transversim costulatis; periphæriâ rotundâ, sulco circulari destitutâ.

Ammonites Gibboniana. Testâ orbiculari; anfractibus compressis; costis elevatis, carinatis, remotiusculis ad periphæriam.

Ammonites Vanuxemensis. Testâ orbiculari, utrinque umbilicatâ; anfractibus convexo-cylindraceis, transversim crebrissimèque costulatis; periphæriâ rotundâ, sulco circulari destitutâ.

Ammonites Americana. Testâ orbiculari; anfractibus subplanis, obliquè costulatis; periphæriâ sulcatâ.

Trigonia Gibboniana. Testâ ovato-trigonâ, multicostatâ; costis transversis, subtuberculato-asperis; areâ posticâ carinatâ.

Trigonia Tocaimana. Testâ trigonâ, posticè productâ inflatâ; costis transversis lævibus.

Trigonia Hondaana. Testâ ovato-trigonâ, inflatâ, multicostatâ; costis transversis, tuberculato-nodosis; areâ posticâ elevatâ, crebrissimèque nodosâ.

Natica Gibboniana. Testâ ovatâ, ventricosâ; spirâ productiusculâ; anfractibus quinis, subplanulatis; aperturâ contractâ, elongatâ.

Spatangus Colombianus. Sp. ovato-cordatus, gibbus, convexus, anticè planulato; ambulacris quinis, lanceolatis, transversim punctatis.

Terebratula Tayloriana. Testâ triangulari, sulcis longitudinalibus impressis; valvâ inferiore in superiorem reflexâ; margine biplicato.

Terebratula Poeyana. Testâ elongato-ovatâ, lævi, inflatâ; nate productâ, incurva; foramine submagno.

Tellina [?] *Humboldtiana.* Testâ scaleniâ, inflatâ, anticè truncatâ; striis transversis, elevatis, remotiusculis, rotundatis.

The Committee, consisting of Dr. Patterson, Prof. Bache, and Mr. Walker, to whom was referred a paper, entitled, "On

the insufficiency of Taylor's Theorem as commonly investigated, with Objections to the Demonstrations of Poisson and Cauchy, and the assumed Generalization of Mr. Peacock; to which is added, a New Investigation and remarks on the Development and Continuity of Functions, by Charles Bonnycastle, Professor of Mathematics in the University of Virginia," reported in favour of its publication in the Transactions of the Society, which was ordered accordingly.

The paper of Professor Bonnycastle is composed of three sections. In the first, which is on the "Development of Functions," he points out and discusses what he considers to be "the errors and conflicting views resulting from the vague manner in which mathematical writers have usually conceived the ultimate object of their peculiar logic." The second section is on the "Continuity of Functions," and the division of this continuity into classes; a subject heretofore touched upon only incidentally by other writers. The principal object of the paper is presented in the third section, which treats of "Functions considered in the order of their magnitude," and particularly of "Taylor's Theorem;" and the author discusses this subject with the care demanded by a theorem which forms the basis of the differential and integral calculus, and which acts so important a part in all the higher mathematics.

Mr. Walker, from the Committee on making and collecting observations of Celestial Phenomena, reported, in part, that they had received observations of Lunar Occultations of the Fixed Stars, which are given in the mean time of the respective places of observation, being a continuation of the list published in No. 6, pages 71 and 72, of the Society's Proceedings; and, on motion, the report was accepted.

	1838.				h	m	s			
48.	Nov. 13,		α Virginis,	Im.	19	31	8.55	d. l.	Hudson Obs'y.	Loomis.
49.	Dec. 25,	57	Mayer,	Im.	7	7	48.95	d. l.	Breslaw ,,	Boguslawski.
50.	,,	102	π Piscium,	Im.	7	22	46.22	d. l.	,,	,,
51.*	,,	,,	,,	Em.	7	34	37.10	b. l.	,,	,,
52.	26,	27	ψ Arietis,	Im.	6	15	46.34	d. l.	,,	,,
53.*	,,	,,	,,	Em.	7	23	24.12	b. l.	,,	,,
54.	,,	,,	,,	Im.	5	31	35.90	d. l.	Elberfeldt,	Hulsman.
55.	,,	,,	,,	Im.	6	27	50.28	d. l.	Cracow Obs'y.	Weisse.

					h	m	s			
	1838.									
56.	Dec. 27,	η	Pleiadum,	Im.	7	29	19.80	d. l.	Cracow Obs'y.	Weisse.
57.	,,	f	,,	Im.	8	13	3.00	d. l.	,,	,,
58.	,,	,,	,,	Im.	16	25	37.94	d. l.	Breslaw Obs.	Boguslawski.
59.	,,	η	,,	Im.	7	29	19.80	d. l.	Dover.	Blickensderfer.
60.	,,	f	,,	Im.	8	15	3.00	d. l.	,,	,,
	1839.									
61.	Jan. 10,	π	Virginis,	Im.	18	19	19.00	d. l.	Southwick,	Holcomb.
62.	,,	,,	,,	Em.	18	34	15.00	d. l.	,,	,,
63.	21,	π	Piscium,	Im.	6	18	58.44	d. l.	Philad. Obs'y.	W. & K.
64.	,,	,,	,,	Im.	6	31	44.00	d. l.	Southwick,	H.
65.	Ap'l 19,	c	Geminorum,	Im.	7	17	35.38	d. l.	Hudson Obs'y.	L.
66.*	,,	,,	,,	Em.	8	25	35.42	b. l.	,,	,,
67.	,,	,,	,,	Im.	7	55	51.65	d. l.	Philad. Obs'y,	W. & K.
68.	,,	,,	,,	Im.	7	58	46.10	d. l.	Princeton, N. J.	A.
69.*	,,	,,	,,	Em.	8	57	43.20	b. l.	,,	,,
70.	,,	,,	,,	Im.	8	9	42.90	d. l.	Southwick,	H.
71.	,,	,,	,,	Im.	8	20	31.90	d. l.	Dorchester,	Bond.
72.	,,	,,	,,	Im.	8	20	31.70	d. l.	,,	,,
73.	,,	,,	,,	Im.	8	20	33.96	d. l.	Boston,	Paine.
74.	20,	γ	Cancri,	Im.	10	6	3.13	d. l.	Hudson Obs'y.	L.
75.*	,,	,,	,,	Em.	10	53	51.08	b. l.	,,	,,
76.	,,	,,	,,	Im.	10	44	24.80	d. l.	Dorchester,	B.
77.	,,	,,	,,	Im.	10	44	24.70	d. l.	,,	,,
78.	,,	,,	,,	Im.	10	44	21.70	d. l.	Boston,	P.
79.	25, 91		Virginis,	Im.	8	13	47.20	d. l.	Philad. Obs'y.	W. P. & K.
80.	,, 50		Virginis,	Im.	8	25	59.50	d. l.	,,	,,
81.	June 20, 68	i	Virginis,	Im.	7	46	28.80	d. l.	Washington,	Gilliss.
82.	,,	,,	,,	Im.	7	57	42.88	d. l.	Philada. Obs'y.	W. & K.
83.	,,	,,	,,	Im.	8	11	57.25	d. l.	Southwick,	H.
84.	June 23,	b	Scorpii,	Im.	8	39	53.90	d. l.	Washington,	G.
85.	,,	,,	,,	Im.	8	50	52.07	d. l.	Philada. Obs'y.	W. & K.
86.	30,	D	Aquarii,	Im.	10	58	50.54	d. l.	,,	,,
87.	July 6,	b	Pleiadum,	Im.	15	29	49.49	b. l.	,,	W.
88.*	,,	,,	,,	Im.	15	29	43.49	b. l.	,,	R.
89.	,,	,,	,,	Em.	16	24	6.99	d. l.	,,	,,
90.	,,	,,	,,	Em.	16	14	7.10	d. l.	Washington,	G.
91.*	,,	Anony.	7th mag.	Im.	15	55	4.49	b. l.	Philada. Obs'y.	W.
92.*	,,	,,	,,	Im.	15	55	4.07	b. l.	,,	R.
93.	,,	d	,,	Im.	16	0	21.49	b. l.	,,	W.
94.	,,	,,	,,	Im.	16	0	18.69	b. l.	,,	R.
95.	,,	,,	,,	Im.	15	32	34.56	b. l.	Hudson Obs'y.	L.
96.	,,	,,	,,	Em.	16	22	28.85	b. l.	,,	,,
97.	,,	c	,,	Im.	16	14	45.29	b. l.	Philada. Obs'y.	W.
98.	,,	,,	,,	Im.	16	14	44.29	b. l.	,,	R.
99.	,,	,,	,,	Im.	16	5	49.10	b. l.	Washington,	G.
100.	,,	,,	,,	Em.	16	33	41.10	d. l.	,,	,,
101.	,,	η	,,	Im.	16	30	24.79	b. l.	Philada. Obs'y.	W.
	,,	,,	,,	Im.	16	30	26.49			

	1839.			h	m	s			
102.	July 6,	An'y.	7th mag.	Im.	16	30	24.49	b. l. Philada. Obs'y.	R.
	,,	,,	,,	Im.	16	30	25.79		
103.	,,	,,	,,	Im.	16	20	17.40	b. l. Washington,	G.
104.	July 14, 59	*c*	Leonis,	Im.	8	2	44.25	d. l. Philada. Obs'y.	W.
105.	Sep. 14,	*τ*	Scorpii,	Im.	6	19	51.92	d. l. ,,	K.
106.	,,	,,	,,	Im.	6	19	51.72	d. l. ,,	W.
107.	,,	,,	,,	Em.	7	47	5.84	b. l. ,,	,,
108.	,,	,,	,,	Im.	6	42	13.71	d. l. Dorchester,	B.
109.	20, 42		Aquarii,	Im.	12	24	39.75	d. l. Philada. Obs'y.	K.
110.	,,	,,	,,	Im.	12	24	40.15	d. l. ,,	W.
111.	,,	,,	,,	Im.	12	45	12.40	d. l. Boston,	P.
112.	26,	*b*	Pleiadum,	Im.	9	41	49.68	b. l. Philada. Obs'y.	W.
113.	,,	,,	,,	Im.	9	41	49.18	b. l. ,,	M.
114.	,,	,,	,,	Em.	10	32	4.73	d. l. ,,	W.
115.	,,	,,	,,	Em.	10	32	7.97	d. l. ,,	K.
116.	,,	,,	,,	Em.	10	32	5.78	d. l. ,,	R.
117.	,,	,,	,,	Em.	10	32	5.13	d. l. ,,	M.
118.	,,	,,	,,	Im.	9	54	6.00	b. l. Southwick,	H.
119.	,,	,,	,,	Em.	10	53	6.90	d. l. Boston,	P.
120.	,,	,,	,,	Em.	10	22	52.60	d. l. Washington,	G.
121.	,,	*g*	,,	Im.	9	45	5.88	b. l. Philada. Obs'y.	M.
122.	,,	,,	,,	Em.	10	39	57.09	d. l. ,,	W.
123.	,,	,,	,,	Em.	10	39	57.67	d. l. ,,	K.
124.	,,	,,	,,	Em.	10	39	58.95	d. l. ,,	R.
125.	,,	,,	,,	Em.	10	39	57.04	d. l. ,,	M.
126.	,,	,,	,,	Em.	11	1	45.27	d. l. Boston,	P.
127.	,,	,,	,,	Em.	10	30	20.20	d. l. Washington,	G.
128.*	,,	*e*	,,	Im.	10	6	37.75	b. l. Philada. Obs'y.	K.
129.	,,	,,	,,	Im.	10	6	39.61	b. l. ,,	R.
130.	,,	,,	,,	Im.	10	6	42.35	b. l. ,,	M.
131.	,,	,,	,,	Em.	10	49	58.93	d. l. ,,	W.
132.	,,	,,	,,	Em.	10	49	59.52	d. l. ,,	K.
133.	,,	,,	,,	Em.	10	50	0.36	d. l. ,,	R.
134.	,,	,,	,,	Em.	10	49	59.33	d. l. ,,	M.
135.	,,	,,	,,	Em.	11	12	36.43	d. l. Boston,	P.
136.	,,	,,	,,	Im.	9	57	40.60	b. l. Washington,	G.
137.	,,	,,	,,	Em.	10	39	59.40	d. l. ,,	,,
138.*	,,	,,	,,	Im.	17	58	17.77	b. l. Breslaw Obs'y.	
139.	,,	*c*	,,	Im.	10	9	11.23	b. l. Philada. Obs'y.	W.
140.	,,	,,	,,	Im.	10	9	11.83	b. l. ,,	M.
141.*	,,	,,	,,	Im.	10	9	7.40	b. l. ,,	R.
142.	,,	,,	,,	Em.	11	6	34.69	d. l. ,,	W.
143.	,,	,,	,,	Em.	11	6	35.04	d. l. ,,	R.
144.	,,	,,	,,	Em.	11	6	35.29	d. l. ,,	M.
145.	,,	,,	,,	Im.	10	22	2.00	b. l. Southwick,	H.
146.	,,	,,	,,	Em.	11	28	58.98	b. l. Boston,	P.
147.	,,	,,	,,	Im.	9	59	56.20	b. l. Washington,	G.
148.	,,	,,	,,	Em.	10	56	42.40	d. l. ,,	,,

	1839.			h	m	s			
149.*	Sep. 26,	42	*c* Pleiadum,	Im.	18	23	52.21	b. l.	Breslaw Obs. Boguslawski.
150.*	,,	66	Arietis,	Im.	9	55	48.14	b. l.	,, ,,
151.*	,,	,,	,,	Im.	9	55	56.85	b. l.	,, ,,
152.	,,	,,	,,	Em.	10	8	36.22	d. l.	,, ,,
153.	,,	,,	,,	Im.	9	22	21.03	b. l.	Hamburg Obs'y. Rumker.
154.*	,,	,,	,,	Em.	9	54	22.77	d. l.	,, ,,
155.	Oct. 14,		τ Sagittarii,	Im.	8	21	56.26	d. l.	Roscoe, O. Blickensderfer.
156.	17,		δ Capricorni,	Im.	8	28	11.50	d. l.	Philada. Obs. W.
157.*	,,	,,	,,	Im.	8	40	10.52	d. l.	New Haven, Mason.
158.*	,,	,,	,,	Em.	9	32	1.04	b. l.	,, ,,
159.	,,	,,	,,	Im.	8	18	19.10	d. l.	Washington, G.
160.	,,	γ	,,	Im.	12	11	46.80	d. l.	Breslaw, B.
161.	18,	58	Aquarii,	Im.	12	5	44.71	d. l.	,, ,,
162.	28.		γ Cancri,	Im.	14	8	30.10	d. l.	Washington, G.
163.	Dec. 12,		λ Aquarii,	Im.	9	22	24.02	b. l.	Philada. Obs'y. W.
164.	,,	,,	,,	Im.	9	22	24.45	b l.	,, R.
165.	,,	,,	,,	Im.	8	25	48.24	b. l.	New Haven, Mason.
166.	,,	,,	,,	Im.	8	25	48.39	b. l.	,, Bradley.
167.	,,	,,	,,	Em.	9	31	57.38	d. l.	,, Mason.
168.	,,	,,	,,	Em.	9	31	57.78	d. l.	,, Bradley.
169.	,,	78	,,	Im.	9	33	36.20	d. l.	Philada. Obs'y. W.
170.	,,	,,	,,	Im.	9	33	38.45	d. l.	,, R.
171.	,,	,,	,,	Im.	9	43	26.84	d. l.	New Haven, Mason.
172.	,,	,,	,,	Im.	9	43	26.89	d. l.	,, Bradley.
173.	July 6,		*b* Pleiadum,	Em.	15	56	22.65	d. l.	Hudson Obs'y. L.
174.	,,		η ,,	Im.	16	2	21.67	b. l.	,, ,,

The longitudes and latitudes of the American places of observation, as far as they can be determined from a reduction of these and former American observations, have been furnished by Messrs. Walker and Kendall, as follows:

Place of Observation.	N. Latitude.	Longitude from Philada. Obs.	Longitude west from Greenwich.
	° ′ ″	m s	h m s
Boston State House	42 21 22.7	E. 16 24.77	4 44 17.13
,, Paine's House	42 20 56	E. 16 25.10	4 44 16.80
Dorchester, Bond's private Obs.	42 19 15	E. 16 24.09	4 44 17.81
Southwick, Holcomb's ,,	42 0 41	E. 9 24.83	4 51 17.07
Yale College, New Haven	41 17 58	E. 8 51.00	4 51 50.90
City Hall, New York	40 42 40	E. 4 37.54	4 56 4.36
Brooklyn, Blunt's private Obs'y	40 42 0	E. 4 41.90	4 56 0.00
Nassau Hall, Princeton College	40 20 50	E. 2 3.70	4 58 38.20
Alexander's House	40 20 56	E. 2 4.00	4 58 37.90
Philadelphia High School Obs'y	39 57 8	0.	5 0 41.90
,, State House	39 56 57.9	E. 2.86	5 0 39.04
Washington, Capitol	38 53 23	W. 7 24.10	5 8 6.00
,, Marine Obs'y	38 53 31	W. 7 24.18	5 8 6.08
Hudson Observatory	41 14 37	W. 25 5.56	5 25 47.46
Dover, Ohio	40 30 52	W. 25 14.02	5 25 55.92

The details of the computations on which these results are based, are too extensive for the limits of this Report. The separate results for the longitude of the Capitol, on account of its importance as being our prime meridian, are here appended.

No.	Date.	Object Observed.	Compared with	Relative weight.	Resulting Lon. from Greenwich.
					h m s
1	1791. April 3	Annular Eclipse	Corr. Obs. European Observatories	3.	5 8 5.38
2	1793. Jan. 21	Occ'n. a Tauri	Merid. ,, ,, ,, ...	0.	5 7 53.08
3	1804. Oct. 20	,, η ,,	,, ,, ,, ,, ...	1.	5 8 6.88
4	1811. Sept. 17	Solar Eclipse	Corr. ,, Salem, Massachusetts	1.5	8.78
5	1813. Jan. 12	Occ'n. γ Tauri	,, ,, European Observatories	0.	27.48
6	1831. Feb. 12	Solar Eclipse	,, ,, Dorchester Observatory	2.	7.82
7	1836. May 15	,, ,,	,, ,, European ,, ...	0.	13.64
8	1838. Sept. 18	Annular Eclipse	,, ,, Philadelphia, Princeton, Southwick and Brooklyn	3.	2.97
9	1839. June 20	Im. 68 i Virginis	,, ,, Philadelphia Obs'y	1.	6.68
10	,, June 23	Im. 1 b Scorpii	,, ,, ,, ,, ...	0.	12.99
11	,, July 6	Em. b Pleiadum	,, ,, ,, ,, and Hudson Obs'y.	1.5	4.84
12	,, ,,	Im. c ,,	,, ,, ,, ,, ,,	0.3	11.66
13	,, ,,	Im. η ,,	,, ,, ,, ,, ,,	1.5	6.10
14	,, Sept. 26	Em. b ,,	,, ,, ,, ,, and Boston	0.6	1.38
15	,, ,,	Im. c ,,	,, ,, ,, ,, and Southwick & Breslaw Obs.	0.6	9.87
16	,, ,,	Em. ,, ,,	,, ,, ,, ,, and Boston	1.5	4.00
17	,, ,,	Em. g ,,	,, ,, ,, ,, ,, ...	1.5	5.86
18	,, ,,	Em. e ,,	,, ,, ,, ,, ,, ...	1.5	6.71
19	,, Oct. 17	Im. δ Capricorni	,, ,, ,, ,, ,, ...	1.0	5.02
20	1840. April 19	Im. τ Scorpii	,, ,, ,, ,, ...	0.7	3.10
,,	,, ,,	Em. ,, ,,	,, ,, ,, ,, ...	0.7	4.97
21	,, May 16	Im. μ Cancri	,, ,, ,, ,, ...	1.0	8.47
				23.9	138.07

	h m s
Marine Obs. Mean of 21 results according to weights	5 8 5.78
Capitol	5.72
Marine Obs. Mean of 6 results by transport'n of chron's, by R. T. Paine, between Washington, Philad. and Boston	6.32
Whence longitude of the Capitol	5 8 6.0

NOTE BY THE COMMITTEE.

The observations at the	Hudson Observatory	are made by		Prof. E. Loomis.
,,	,,	Washington Marine Obs'y.		Lieut. S. M. Gilliss.
,,	,,	Boston,		R. T. Paine, Esq.
,,	,,	Dorchester Obs'y.		Wm. Cranch Bond.
,,	,,	Southwick, Mass.		Mr. A. Holcomb.
,,	,,	Princeton,		Prof. S. Alexander.
,,	,,	Dover, Ohio,		Mr. J. Blickensderfer, Jr.
,,	,,	Brooklyn Obs'y.		Mr. E. Blunt.
,,	,,	New Haven,	Mr. E. P. Mason and Mr. Bradley.	
,,	,,	Philadelphia Obs'y.	W	is for Mr. S. C. Walker.
,,	,,	,,	K	,, Prof. E. O. Kendall.
,,	,,	,,	R	,, Wm. H. C. Riggs.
,,	,,	,,	M	,, Mr. E. P. Mason.
,,	,,	,,	P	,, R. T. Paine, Esq.

The numbers which have an asterisk (*) prefixed to them are considered by the observers as somewhat doubtful, from brightness of the moon's limb or other causes. The European observations have been selected from those published in Schumacher's Astronomische Nachrichten, on account of their coincidence in date with the American observations. The immersion and emersion of ω Piscium, January 10th, 1839, took place both at the moon's dark limb. At the immersion of η Pleiadum, July 6th, 1839, the star appeared to hang on the moon's bright limb about 1.7s; or rather, the star appeared to have a sensible disc taking that time to immerge.

Professor Henry presented a communication, entitled "Contributions to Electricity and Magnetism, Fourth Series.—On Electro-dynamic Induction, Magnetic Distribution, &c.,—by Joseph Henry, Professor of Natural Philosophy, College of New Jersey, Princeton;" and accompanied the presentation of the same with sundry verbal and graphic illustrations.

The communication was referred to a committee.

Mr. Du Ponceau presented a communication, entitled "An Historical Account of the origin and formation of the American Philosophical Society, held at Philadelphia, for promoting Useful Knowledge;" when, in consquence of the lateness of the hour and the amount of unfinished business, it was resolved, that the Society do adjourn to meet again on Friday evening next, and that due notice thereof be given in the public papers by the Librarian.

Adjourned Meeting, June 27.

Present, twenty-four members.

Mr. Du Ponceau, President, in the Chair.

The communication of Mr. Du Ponceau relative to the origin and formation of the Society, which was presented at the last meeting, was read, and referred to a committee.

A letter was read from Mr. Fisher to Mr. Kane, one of the Secretaries, in relation to the subject of Mr. Du Ponceau's communication, and explanatory of a communication on the same subject from Mr. Fisher, which was afterwards read. The letter and communication were referred to the committee who had charge of the communication of Mr. Du Ponceau.

On motion, it was resolved, that the Maryland Academy of Science and Literature, and the Sociedad Economica de Amigos del Pais de Valencia, should hereafter be furnished regularly with a copy of the published Proceedings of this Society.

Mr. Vaughan announced the death of Mr. Wm. H. Keating, a member of the Society, which took place in London, on the 17th of May; and, on motion of Mr. Kane, it was resolved, that a member of the Society be requested to prepare an obituary notice of the deceased. Dr. Hays was appointed to that office.

In consequence of unfinished business still remaining, it was resolved, that the Society should adjourn to meet again on Friday evening next, and that due notice thereof be given in the public papers by the Librarian.

Adjourned Meeting, July 3.

Present, twenty members.

Mr. Du Ponceau, President, in the Chair.

Professor Bache read a letter from Mr. Rumker, of Hamburg, acknowledging the honour of his election as a member

of the Society, and containing astronomical observations in reference to Galle's comets.

The communication was referred to the Committee on Astronomical Observations.

Mr. Breck, after some prefatory remarks, presented for the Library, and read, a Manuscript Essay, written by him for the Society, and entitled "Historical Sketch of the Continental Bills of Credit, from the year 1775 to 1781, with specimens thereof;" which was referred to the Historical Committee.

Mr. Du Ponceau announced that the Society would receive at their next meeting, the Anamitic and Latin and Latin and Anamitic Dictionaries, lately published by the Right Reverend Father Taberd, Bishop of Isauropolis, and Vicar General of Cochin China, which he had mentioned to the Society at a former meeting, as in course of publication.

This valuable work was printed at Serampore, under the auspices, and, it is understood, at the expense, of the British Government in India, and of the East India Company, to whom the learned world are already indebted for the publication of the important labours of the late Dr. Morison, and other works, which have thrown considerable light on the Chinese language, and who are now, with the same liberality, extending the knowledge of the Indo-Chinese idioms, which, until lately, were entirely unknown in America and Europe. It will not be forgotten, Mr. Du Ponceau added, that this Society was the first to make known the Anamitic language, by the publication of Father Morrone's French and Cochin Chinese Vocabulary, and of the Latin and Cochin Chinese Dictionary, in use among the Missionaries in Cochin China, which works, though not so full and so complete as thosep ublished by Bishop Taberd, were the first to shed light on that branch of philological science.

Mr. Du Ponceau further observed, that these publications have settled a point, which has been warmly contested by travellers, and others who have contended (and the view has even gained belief among sinologists) that not only the Anamites, whose languages are monosyllabic, and formed on the model of that of China, but the Japanese and Loo Chooans, whose idioms are polysyllabic, and formed on quite different principles, could converse with the Chinese and with each other, without knowing one word of each other's spoken lan-

guage, by means of the Chinese characters, which presented (it was affirmed) to their minds, ideas unconnected with words. Bishop Taberd asserts, on the contrary, that the Cochin Chinese and Chinese cannot understand each other, either orally or in writing; and that the Chinese is, in Cochin China, a learned language, which is studied by the better class, who, by that means, can communicate with the Chinese, but not by means of the vulgar language, spoken or written.*

The following extract contains a statement of these facts in Bishop Taberd's own words.

"Præcipuum nùnc nobis incumbit pauca de characteribus nec non de linguâ Anamiticâ delibare. Dubium non est quin Anamitarum lingua à Sinensi ortum ducat. Ipsorum enim characteres non tantum magnam habent affinitatem cum Sinensibus, sed vel integrè vel particulatìm ab ipsis mutuantur. Attamen utriusque gentis characteres seu hieroglyphi talem subiere commutationem, ut neque legendo, neque loquendo se invicem intelligant. Qui ex honestâ oriuntur familiâ Sinensibus characteribus dant operam, illi enim characteres in usu sunt apud Anamitas tùm in legibus tum in supplicibus libellis et aliis. Qui magna spectant, vel honoribus dignitatibusque inhiant, toto pectore animique impetu in characterum Sinensium studium incumbere debent, et hos scribendo characteres cum Sinensibus colloqui possunt, adeò diversus est pronounciationis modus inter utramque gentem, ut aliter sermonem mutuum habere nequeant. Undè duæ linguæ usurpantur in Cocincinà; scilicet, lingua Doctorum, seu lingua Sinensis, et lingua communis quæ in usu quotidiano ab omnibus adhibetur et de quâ nunc sermonem habemus." Monit. p. 1.

Dr. Hare presented copies of a French translation of a Communication, which he had made to the Society, on the subject of Tornadoes, and in reference to a Memoir, by M. Peltier, on the Cause of these Meteors. (See Proceedings of the Society for October 4, 1839, No. 8, p. 122.) The Communication had been translated by him into French, and sent to each member of the National Institute, with the object of showing that the view of M. Peltier, as contained in the *Journal des*

* This, as the Transactions and Proceedings of the Society testify, has always been the opinion of Mr. Duponceau; but it has been much combated both in Asia and Europe.

Débats of the 17th of July last, was essentially the same as the one which he (Dr. Hare) had offered relative to these meteors; and also that the allegation made before the Academy, by M. Peltier, that Dr. Hare's hypothesis was defective in not taking into account other co-operating forces, as well as those of electricity, was incorrect.

Dr. Hare made some observations on the effect of the rarefaction of air, on its desiccation and refrigeration, and on other phenomena connected with the presence of aqueous vapour in the atmosphere. He also detailed some experiments, showing that the phenomena of air, heated by re-entering a receiver partially exhausted, were more consistent, in some respects, with the idea that a vacuum has a capacity for heat, than that it is destitute of any appropriate portion of caloric.

Dr. Hare adverted to the fact, that in an essay, published in Silliman's Journal in 1822, he had, agreeably to the authority of Dalton and Davy, stated, that the cold consequent on the rarefaction of air in its ascent towards the upper strata of the atmosphere, was one of the causes of the formation of clouds; and in his text-books he had soon after published an engraving of an apparatus, by means of which he was accustomed to illustrate, before his pupils, the transient cloud which arises from a diminution of pressure in air containing aqueous vapour.

In the essay above mentioned, Dr. Hare had alleged, that as much caloric was given out by aqueous vapour, during its conversion into snow, as would be yielded by twice the weight of red-hot powdered glass. But Mr. Espy, he considered, had the merit of being the first to suggest, that the heat, thus evolved, might be an important instrument in causing a buoyancy tending to accelerate any upward current of warm moist air.

Dr. Hare had been willing to admit, that this transfer of heat might co-operate with other causes in the production of storms, but could not concur with Mr. Espy in considering it competent to give rise to thunder-gusts, tornadoes, or hurricanes. These he had considered, and still considers, to be mainly owing to electrical discharges between the earth and the sky; or between one mass of clouds and another.

With a view to a more accurate estimate of the comparative influence of rarefaction and condensation, in causing evolution of heat in dry air, and in air replete with aqueous vapour, Dr. Hare had performed a number of experiments, of which he proceeded to give a description.

Large globes, each containing about a cubic foot of space, furnished with thermometers and hygrometers, were made to communicate, respectively, with reservoirs of perfectly dry air, and of air replete with aqueous vapour.* The cold, ultimately acquired by any degree of rarefaction, appeared to be the same, whether the air was in the one state or the other; provided that the air, replete with aqueous vapour, was not in contact with liquid water in the vessel subjected to exhaustion. When water was present, in consequence of the formation of additional vapour, and a consequent absorption of caloric, the cold produced was nearly twice as great as when the air was not in contact with liquid water; being nearly as 9 to 5.

Under the circumstances last mentioned, the hygrometer was motionless; whereas, when no liquid water was accessible, the space, although previously saturated with vapour, by the removal of a portion of it together with the air which is withdrawn by the exhaustion, acquires a capacity for more vapour; and hence the hygrometer, by an abstraction of one-third of the air, revolved more than sixty degrees towards dryness. But when a smaller receiver (after being subjected to a diminution of pressure of about ten inches of mercury, so as to cause the index of the hygrometer to move about thirty-five degrees towards dryness) was surrounded by a freezing mxiture, until a thermometer in the axis of the receiver stood at three degrees below freezing, the hygrometer revolved towards dampness, until it went about ten degrees beyond the point at which it rested when the process commenced.

It appears, therefore, that the dryness produced by the degree of rarefaction employed is more than counterbalanced by a freezing temperature.

As respects the heat imparted to the air above mentioned, the fact, that the ultimate refrigeration in the case of air replete with vapour, and in that of anhydrous air, was equally great, and that when water was present the cold was greater in the damp vessel, led to the idea,

* The hygrometers were constructed by means of the beard of the avena sensitiva or wild oat, also called animated oat.

that the heat arising under such circumstances could not have much efficacy in augmenting the buoyancy of an ascending column of air: but when, by an appropriate mechanism, the refrigeration was measured by the difference of pressure at the moment when the exhaustion was arrested, and when the thermometer had become stationary, it was found, cæteris paribus, that the reduction of pressure arising from cold was at least one-half greater in the anhydrous air, than in the air replete with vapour. This difference seems to be owing to a loan of latent heat made by the contained moisture, or transferred from the apparatus by its intervention, which checks the refrigeration; yet, ultimately, the whole of the moisture being converted into vapour, the aggrgate refrigeration does not differ in the two cases.

Agreeably to Dalton's tables, at 70° the quantity of moisture in 31 grains or 100 cubic inches of air, is $\frac{551}{1000}$ of a grain. The space allotted to this weight of vapour being doubled, it would remain uncondensed at 45° F., being associated with the same weight, but double the volume, of air; but at 32°, notwithstanding the doubling of the space, only $\frac{356}{1000}$ of a grain would remain in the aëriform state; of course $551 - 356 = \frac{195}{1000}$, or nearly $\frac{2}{10}$ of a grain, would be precipitated.

The latent heat given out by the condensation of this vapour would heat, as is well known, 1000 times its weight of water, or 195 grains, one degree; or 31 grains $\frac{195}{31} = 6.29$ degrees; and as the capacity of air for heat is only one-fourth of that of water, it would heat 31 grains of air $6.29 \times 4 = 25.16$, or nearly 25° F. As air, at 32° F., expands $\frac{1}{480}$ for each additional degree, the difference of bulk, arising from the heat received, as above calculated, would be $\frac{25}{480}$, or $\frac{1}{19}$ nearly.

When air, replete with aqueous vapour, was admitted into a receiver partially exhausted, and containing liquid water, a copious precipitation of moisture ensued, and a rise of temperature greater than when perfectly dry air was allowed to enter a vessel containing rarefied air in the same state. In the instance first mentioned, a portion of vapour rises into the place of that which is withdrawn during the partial exhaustion. Hence when the air, containing its full proportion of vapour, enters, there is an excess of vapour which must precipitate, causing a cloud, and an evolution of latent heat from the aqueous particles previously in the aëriform state. Dr. Hare conceives that as the enlargement of the space occupied by a sponge,

allows, proportionably, a larger quantity of any liquid to enter its cells, so any rarefaction of the air when in contact with water, consequent on increase of heat or diminution of pressure, permits a proportionably larger volume of vapour to associate itself with a given weight of the air. When, subsequently, by the afflux of wind replete with aqueous vapour, the density of the aggregate is increased, a portion of the vapour equivalent to the condensation must be condensed, giving out latent heat, excepting so far as the heat thus evolved, being retained by the air, raises the dew point.

Hence, whenever a diminution of density of the air inland causes an influx of sea air to restore the equilibrium, there may result a condensation of aqueous vapour, and evolution of heat, tending to promote an ascending current. This process being followed by that which Mr. Espy has pointed out, of the transfer of heat from vapour to air during its ascent to the region of the clouds, and consequent precipitation of moisture, might, Dr. H. thought, be among the efficient causes of those *non*-electrical rain storms, during which the water of the Gulf of Mexico, or of the Atlantic, is transferred to the soil of the United States.

Dr. Hare proceeded to mention some additional experiments which he had made, respecting the increase of temperature resulting from the admission of dry air into an exhausted receiver. When the receiver was exhausted so as to reduce the interior pressure to one-fourth of that of the atmosphere, and one-fourth was suddenly admitted, so as to reduce a gage from about 22½ inches to 15 inches, heat was produced; and however the ratio of the entering air to the residual portion was varied, still there was a similar result.

When the cavity of the receiver was supplied with the vapour of ether or with that of water, so as to form, according to the Daltonian hypothesis, a vacuum for the admitted air, still heat was produced by the latter, however small might be the quantity, or rapid the readmission. When the receiver was exhausted, until the tension was less than that of aqueous vapor at the existing temperature, so as to cause the water to boil, as in the Cryophorus, or Leslie's experiment, still the entrance of $\frac{6}{1000}$ of the quantity requisite to fill the receiver caused the thermometer to rise a tenth of a degree. An alternate motion of the key of the cock, through one-fourth of a circle, within one-third of a second of time, was adequate to produce the change last mentioned.

Dr. Hare considered the fact, that heat is produced, when to air, rarefied to one-fourth of the atmospheric density, another fourth is added, irreconcilable with the idea, that this result arises from the compression of the portion of air previously occupying the cavity, since the entering air must be as much expanded as the residual portion is condensed.

As, agreeably to Dalton, a cavity occupied by a vapor acts as a vacuum to any air which may be introduced, Dr. Hare argued, that when a receiver, after being supplied with ether or water, is exhausted so as to remove all the air and leave nothing besides aqueous or ethereal vapor, the heat, acquired by air admitted, cannot be ascribed, consistently, to the condensation of the vapor.

The facts above stated, he added, are not reconcilable with the idea of De la Rive and Marcet, that the first portion of the entering air is productive of cold, although a subsequent condensation is productive of an opposite change. The effect upon the thermometer was too rapid, and the quantity of the entering air too minute, to allow it to be refrigerated by rarefaction in the first place, and yet afterwards to be so much condensed as to become warm by the evolution of caloric.

Notwithstanding the experiments of Gay Lussac and of those of De la Rive and Marcet, there appeared to Dr. Hare to be evidence in favor of the heat being due to the space, rather than to the air which it contained.

With respect to Gay Lussac's celebrated experimeut with the Torricellian vacuum, supposing such a vacuum to be a pre-eminently good liberator of heat, as it ought in reason to be, the caloric would be absorbed by the mercury as rapidly as this metal could be made to encroach upon the space occupied by the calorific particles.

Admitting that, for equal weights, the specific heat of air is seven times as great as that of mercury, there could not have been a capacity greater than that of about 200 grains of the metal, whereas a very small stratum of this metal, equal to one-fourth of an inch, would, in the apparatus employed, amount to more than a pound.

The rapidity with which a mercurial thermometer is affected by the changes of temperature, in experiments like those which he had been describing, showed, in Dr. Hare's opinion, that there was something not yet understood respecting the transfer of heat in such cases. It was hardly reconcilable with the process of conduction or circulation, as ordinarily understood.

In the experiments of De la Rive and Marcet, in which the entering air being made to impinge upon the bulb of a thermometer, was productive of a fall in the thermometric column, it might be inferred, he conceived, that the bulb interfered with the access of caloric from the space. It was in fact the bulb upon which the air acted previously to its distribution in the space where it could have encountered the due proportion of caloric.

Professor Bache, from the Committee on magnetic observations, read an extract from a letter of Major Sabine, V. P. of the Royal Society of London, stating that the Council of the Society had, on the recommendation of the Committee of Physics, expressed their opinion of the importance of the plan of combined magnetic observations now in progress, that observatories should be established in the United States, and had instructed their President to bring this expression of opinion to the knowledge of the government of this country.

Professor Bache stated that the resolution just referred to had been adopted with a view to aid the efforts of this Society in procuring the erection of observatories, as recommended in their Memorial to the Secretary of War, which had been referred, by that officer, to Congress.

He also read an extract from a subsequent letter from Major Sabine, in reference to the progress of the combined magnetic observations, stating that the Emperor of Russia had ordered the erection of nine magnetic and meteorological observatories in his dominions, to conform in respect to instruments and times of observations, to the system recommended by the Royal Society. One of these observatories is to be upon the Northwest coast of America.

Professor Bachè stated that the regular system of bi-hourly magnetic and meteorological observations was now established in the observatory at the Girard College, and had been in progress since the close of the month of May. He intended, at a future day, to present to the Society the names of the gentlemen, chiefly members of the American Philosophical Society, by whose contributions a fund had been raised to defray the expense of employing the assistants required for these observations.

On the occasion of the May magnetic term day for observations at short intervals, a brilliant aurora had occurred, during which the magnetic instruments were very much disturbed. The details were reserved for future presentation, but it was perhaps proper now to state, that an auroral arch had been visible here a little after ten o'clock. The same phenomenon was observed at Southwick, Mass., by Mr. Holcomb, at a much earlier hour.

Professor Bache read an extract of a letter addressed by Mr. Forshey, of Natchez, to Mr. Espy, in reference to the tornado which occurred there recently.

The writer stated that he had spent much time in examining the track of the storm in the vicinity of Natchez. He had ascertained its extent to have been not less than five or six miles below the city, and twenty miles beyond; its effects having been felt, but with less violence, for nearly one hundred and fifty miles. The track near Natchez was directed sixty degrees to the east of north. After describing the destruction of the city of Natchez, the writer states, that objects were everywhere blown towards the track of the storm; those directed most westwardly lying invariably below those directed more eastwardly. Mr. Forshey also describes the effect upon the houses as of an explosion outwards. In his view, these facts strongly confirm Mr. Espy's theory of this meteor.

Professor Bache referred to the conformity between the phenomena described by Mr. Forshey, and those which were ascertained by Mr. Espy and himself to have occurred at New Brunswick, N. J., in the tornado of June, 1825.

Stated Meeting, July 17.

Present, thirty-five members.

Mr. Du Ponceau, President, in the Chair.

The following donation was received:—

FOR THE CABINET.

A beautiful and ingeniously contrived Balloting Box, of Mahogany, for the use of the Society.—*From Mr. T. U. Walter.*

The Astronomical Committee, consisting of Dr. R. M. Patterson, Mr. Sears C. Walker, and Prof. A. D. Bache, to whom was referred the communication of Mr. Rümker, of Hamburg, on the three comets discovered by Galle, of Berlin, reported in favour of its publication in the Society's Transactions, which was ordered accordingly.

Dr. Dunglison, as Secretary of the Historical and Literary Committee, reported the minutes of the Committee in relation to several subjects referred to them. Whereupon, on motion of Mr. Kane, it was resolved, that so much of the proceedings of the committee as refers to the paper of Mr. Breck entitled, "Historical Sketch of the Continental Bills of Credit, from the year 1775 to 1781, with specimens thereof," and contains a resolution, that the paper is worthy of publication in the next volume of the Transactions of the Historical and Literary Committee, is approved by the Society, and the publication thereof ordered accordingly.

Immediately after the battle of Lexington, which took place in April, 1775, the Colonial Congress began to prepare for war. Having neither funds, nor the means of creating any for present use, either by taxation or loans, they adopted the plan of issuing paper money. Whereupon, even before the battle of Bunker's Hill, one million of dollars were emitted, in bills of various denominations, from one-third, one-half, and two-thirds of a dollar, to eight dollars; and subsequently of denominations varying from thirty to eighty dollars. These bills were made payable to bearer, and entitled him to receive Spanish milled dollars for them, or their value in gold or silver; and for their redemption, Congress bound the thirteen Confederated Colonies. Contracts were made at Philadelphia for printing the bills; and thirty individuals of that city were appointed by Congress, to divide the labor of signing them, so as to have commonly two names on each bill. Appropriate mottoes, in Latin, were placed on the obverse, and a rudely printed emblem on the reverse. Treasurers were named to administer these funds, at an annual salary of five hundred paper dollars.

The Colonies were called upon to tax themselves for the repayment of this money; and the quota of each was determined, according to

the number of its inhabitants, including negroes and mulattoes. Virginia ranked first, Massachusetts second, Pennsylvania third; and New York came in with Connecticut and North and South Carolina. When the treasurers happened to have gold or silver, they were directed to advertise their readiness to exchange the same for paper; and some individuals, ardently patriotic, sent large sums of metallic money to the treasury, and received bills of credit in return at par. In the course of the year 1775, ten millions of dollars were emitted.

The next year independence was declared, and some specie having been imported, the credit of the bills was well sustained; and, in order to avoid interruption in striking them off, the printers were excused from military duty.

The press was now in permanent operation, and the sums emitted so large, that public confidence began to diminish, while ruinous fluctuations in the prices of every commodity took place. Upon this, Congress gave new assurance of their intention to redeem every dollar; and availing themselves of the good effect of this promise, they issued this year (1776) in loan office certificates, lottery tickets and bills of credit, about twenty millions. Yet, fearful of a renewed depreciation, they authorized General Washington to take whatever he might want for the use of the army, whenever the inhabitants refused to sell, and to imprison and report the names of all those who rejected the continental currency. These harsh measures did not, however, strengthen the credit of the bills; and Congress passed, in the beginning of 1777, vehement resolutions of accusation against the enemies of liberty, for impairing their credit, by raising the nominal value of gold and silver. The States were exhorted to pass laws to compel every one, under the penalty of forfeiture of goods, &c., to take them at specie value; to make them a tender in payment of debts, and the refusal to receive them *an extinguishment of such debts.*

About twenty-one millions had been raised in 1777, on loan and bills, when, on the 3d of December of that year, Congress found themselves obliged to acknowledge that the quantity issued was too great.

A pause was resolved upon, and recourse had to France for a loan of two millions sterling. Meantime, the British at New York, and others elsewhere, counterfeited extensively; provisions and merchandise increased manifoldly in price, and the current money fell to four for one. Much of this unsteadiness was ascribed by Congress "to a spirit of sharping and extortion."

In the year 1778, the press was again in full operation, and sixty-

three millions were issued, at three and four for one; for, abused as this prolific source had been, and continued to be, it seemed to offer greater advantages than any other of the various means that Congress had tried. Very little hard money circulated; for, while this large sum in paper was paid out in the single year of 1778, only seventy-eight thousand dollars in specie passed through the treasury.

Taxes were recommended as a sinking fund; but the credit of the bills had fallen too low to be forced upon the public at the scale fixed by Congress; it was, therefore, ordered by that body, on the 8th of October, 1778, "That all limitation of prices of silver and gold be taken off."

The appeal by Congress, on asking for taxes, is clothed in stirring language. They think the redemption of the bills no difficult matter; and, upon this conviction, send forth fifty millions, giving this time an assurance to pay the whole, on or before the 1st of January, 1797.

During the following year, 1779, sixty-three millions were emitted; and now the amount abroad having reached the enormous sum of one hundred and sixty millions, Congress resolved to stop the press, whenever the increase should extend to two hundred millions. This sum, with others due elsewhere, would swell the grand total at the end of the war, they supposed, to three hundred millions. Stupendous, says Mr. Breck, as this debt was for a community in its infancy, they thought the resources of the country equal to the payment of the whole. "There are at present," they say, "three millions of inhabitants in the thirteen States; and this sum divided, per head, would give but one hundred dollars for each to pay, in eighteen or twenty years; and if the debt be assessed in proportion to the wealth of the inhabitants, the poor man's share would not be more than ten dollars; and if twenty years be taken to pay the debt, our population will be nearly double, and our ability to pay increased more than twofold." Again, they say: "This paper money has been eminently serviceable, and cannot 'make unto itself wings and fly away.' It remains with us; it will not forsake us; it is always ready for purposes of commerce or taxes; and every industrious man can find it. Having pledged our lives, fortunes and sacred honor for our independence, the same pledge is given for the redemption of these bills." "A bankrupt, faithless republic," adds this Congressional address, "would be a novelty in the political world, and appear like a common prostitute among chaste and respectable matrons. It is impossible that America should think, without horror, of such an execrable deed."

The hopes of that patriotic body were not realized. These bills, which have never been paid, defrayed the chief expense of five years of active warfare, in which specie bore so small a share, that the official accounts of the years 1788 and 1779 show only one hundred and fifty-six thousand dollars, paid out of the treasury in hard money during those two years, against ONE HUNDRED AND THIRTY MILLIONS in paper. This paper was suffered to depreciate to one thousand dollars for one in silver, and there it died without redemption—the vast sum of two hundred millions being extinguished by a gradual depreciation.

It was further resolved, that such part of the proceedings of the Historical Committee as refers to a MS. communication, entitled "A Grammar of the Mohawk Dialect of the Iroquois Language, or of the Five Ancient Confederated Nations; containing Rules and Exercises intended to Exemplify the Indian Syntax, according to the best Authorities, preceded by succinct Rules relative to the Pronunciation, by Eleazer Williams, Missionary of the Protestant Episcopal Church at Green Bay, Michigan;" and contains a resolution that the paper is worthy of publication in the next volume of the Transactions of the Historical and Literary Committee, is approved by the Society, and its publication ordered accordingly.

Dr. Hare read a communication, entitled "On the Change effected in the Nitrates of Potash and Soda, by the limited application of Heat, with a view to obtain pure Oxygen: and, also on a Liquid and a Gaseous Ethereal Compound, resulting from the reaction of Nascent Hyponitrous Acid on Alcohol," &c., which was referred to a committee.

Mr. Nicklin read the dedication to the Society, of a Memoir on the Geology of North America, by Dr. Daubeny of Oxford, and accompanied the same by some remarks.

Mr. Nicklin stated that he should not have brought Dr. Daubeny's dedication before the Society, had it been one of mere form and flattery, but as it was a paper of research, showing much depth of observation, and justness of conclusion, and was written in a spirit evincing the best feeling towards his brethren on this side of the Atlantic, he thought it due both to the Society and the author, that it should be read at a stated meeting.

Mr. Du Ponceau made a verbal communication in regard to certain interesting works, now in course of publication in Europe,—in reference to the discovery, geography and history of America—and especially to that of M. Ternaux Compans. He also referred to the conclusions of Don Alonzo Zurita, in regard to the Mexican Picture Writing.

Mr. Du Ponceau remarked, that the American hemisphere, its discovery, geography, and history, seem to engage the attention of the learned in Europe, as much as they did in the sixteenth century. The great work of Baron Humboldt, entitled, "Examen Critique de l'Histoire de la Géographie du Nouveau Continent, et des progrès de l'Astronomie Nautique aux 15e & 16e siècles," has now reached its fifth volume, and only comes down to the third and fourth voyages of Amerigo Vespucci. Another work, less learned, but not less important, is now in course of publication at Paris, by M. Ternaux Compans, of which fourteen volumes have already appeared. It is entitled, "Voyages, Relations et Mémoires Originaux pour Servir à l'Histoire de la Découverte de l'Amérique, publiés pour la première fois en Français." The *Journal des Savants* considers this collection as of the "highest interest." It contains many rare works, now out of print, written in different languages, and difficult, if not impossible, to be obtained;—several of which have not appeared in any other compilation.

Among these is a "Report on the Different Classes of Chiefs in New Spain," by Alonzo Zurita. This work, says the *Journal des Savants*, contains the best, the fullest, and the most interesting account of the system of government, and of the laws, usages, manners and customs of the Mexicans before the Conquest, and proves them to have been by no means so barbarous and uncivilized a people as they have been represented by their conquerors, who, by degrading them, thought to justify their own barbarity. Zurita was employed in Mexico by the Emperor Charles the Fifth, and resided there nineteen years, with the power of a magistrate and the curiosity of a philosopher. The work has not yet made its way into this country; but the Journal des Savants for the month of January last contains an ample and very interesting notice of it, and a full account of its contents. Speaking of the Mexican picture writing, this author, who was in Mexico not long after the Conquest, and had opportunities

which are lost to the present generation, says: "that those characters had a *cursive* form, or running hand, and were capable of representing all the *sounds*, and all the proper names." This would show that the characters were connected with the *spoken* language, which is the doctrine advanced by Mr. Du Ponceau in his Dissertation on the Chinese System of Writing.

Mr. Du Ponceau expressed a hope that this interesting subject might be further investigated.

Mr. Vaughan informed the Society that Mr. Charles P. Fox, who possessed a large collection of the original letters and papers of Benjamin Franklin, had deposited them with the Society.

The Franklin papers were bequeathed, by will, to George Fox, father of C. P. Fox, by Temple Franklin, grandson to Benjamin Franklin, and by him submitted to Mr. Sparks, to aid him in the completion of his edition of Franklin's works. Mr. Sparks recommended Mr. Fox to deposit them with the Society, of which Franklin was so long President.

Dr. Hare made a communication respecting an extensive voltaic apparatus, of the form which he had designated by the name of galvanic deflagrator. This apparatus had been constructed for the Lowell Institute of Boston, under his direction, by request of Professor Silliman.

It consists of four troughs, each containing 100 pairs within a space of about 30 inches in length. The pairs, severally, are of the Cruickshank pattern, and about 6½ inches square, independently of the grooves, so as to expose about 42 inches of zinc surface. Every fifth plate is cemented into its groove by a compound of rosin and suet. The plates, intermediate between those thus cemented, are made to fit tightly into their grooves; but in consequence of a slight obliquity in their sides, can be extracted by the aid of forceps, so as to be cleansed, and, when expedient, scraped. The cementing of each fifth plate tends to prevent any injurious retrocession of the voltaic fluid; and yet when the intermediate four plates are removed, an interstice is vacated, sufficiently large to allow the stationary metallic surfaces to be reached by a scraper. The plates are all amalgamated, which not only renders them less susceptible of wasteful reaction with acid, but more susceptible of being cleaned. A strip of wood,

13 inches wide and 2 inches deep, is bored by a centre-bit, so as to have eight vertical and cylindrical holes, which are all supplied with mercury. By means of ropes of copper wire, these holes are made to communicate severally with the poles of each of the troughs, so that every one of these has its corresponding mercurial receptacle. Arches of twisted copper wire are provided of such various lengths, that the receptacles may be connected in such manner as to cause the associated troughs to act either as one series of 400 pairs each of 42 inches of zinc surface; as a series of 200 pairs each of 84 inches of zinc surface; or as a series of 100 pairs each of 168 inches of zinc surface. In the usual mode of constructing the voltaic apparatus, the diversities of power that appertain to an apparatus in which the ratio of the size of the pairs to their number varies, as above described, can only be produced by changes in the arrangement, which are too inconvenient to be employed; but, according to the contrivance described, are attainable simply by shifting the connecting arches, so as to alter duly the mode in which the receptacles are connected with each other.

By means of this apparatus, the deflagration of metals, the arched flame between charcoal points, the fusion of platina by contact with the aqueous solution of chloride of calcium, the welding of iron wire to a rod of the same metal under water, were all accomplished with the most striking success.

In repeating Davy's experiment, in which the arched flame between charcoal points was subjected to the influence of a permanent magnet, the reaction between the voltaic and magnetic fluids was so violent, as to be productive of a noise like that of small bubbles of hydrogen inflamed in escaping from the generating liquid. This last mentioned experiment was performed by request of Prof. Henry, who manipulated in the performance of it.

Dr. Hare stated, that he had for many years endeavoured to draw the attention of men of science to the fact, that if, when a fine and a coarse wire of platina are made to form the electrodes or poles of a powerful voltaic series of not less than 300 pairs, the coarse wire, while forming the positive end or anode, be introduced into a concentrated solution of chloride of calcium, and the fine wire be made to touch the surface of the solution, fusion of the extremity into a globule will follow every contact. But when the polarity of the wires is reversed, the resulting ignition is comparatively feeble.

This experiment, Dr. Hare stated, was repeated to the satisfaction

of Professors Silliman, Henry, and James Rogers, all of whom were present at the trial of the apparatus.

When the finer wire was plunged about an inch below the surface of the solution, it became luminous throughout, emitting rays of a brilliant purple hue.

For the fusion of the platina wire, in the experiment above described, it was found necessary to use the whole series consecutively as 400 pairs; showing, Dr. Hare remarked, that there are effects which require a great number of pairs. He had, in previous experiments, found that fresh phosphuret of calcium was a conductor for 350 pairs of 7 × 3, but not for 100 pairs of 7½ × 14.

The deflagration of an iron wire by contact with mercury, took place with phenomena which were never before witnessed by any of the spectators. At first the mercury was deflagrated with an intense silvery white light, after which there arose a vertical shower of red sparks, caused by the combustion of the iron. Lastly, a globule having accumulated at the end of the wire after a momentary stoppage of the reaction, an explosion took place, by which fragments of the globule, together with portions of the mercury, were projected to a great distance.

It would seem, said Dr. Hare, as if a globule of peroxide of iron, having formed at the end of the wire, caused a temporary arrestation of the voltaic current; but that the apparatus, gaining energy in consequence of a transient repose, was able to break through the globule so as to disperse its particles with violence.

Mr. Walker made some remarks on the tornado, of limited extent, which visited Philadelphia on the 13th instant.

Mr. Walker's own observations, and those of several intelligent individuals, on different sides of the central path, led him to the conclusion, that the currents from without the borders of the tornado were directed, in every instance, towards its centre. This was manifest from the motion of the clouds, in the different strata of the atmosphere. The theory of the central tendency of the currents in tornadoes, usually ascribed to Mr. Espy, was, Mr. Walker remarked, of older date, having been advanced by Franklin in the middle of the last century. The whirl, on which so much stress is laid by Mr. Redfield and Colonel Reid, was distinctly seen in the lower current, where the condensed vapour, resembling spent steam, moved round in a spiral, making several turns downwards, each of smaller dimen-

sions than the preceding, and resembling the motion of water in a common whirlpool. This circumstance seemed, to Mr. Walker, somewhat contradictory to part of Mr. Redfield's theory, that of the gradual enlargement of the periphery of the whirl, whereas the motion in the present instance was in a spiral tending inwards.

Mr. Lee confirmed, from his own observations, the central tendency of the outer currents, and the spiral motion of the clouds in the lower stratum, near the centre of the tornado.

Dr. Hare made some remarks on the same atmospheric phenomenon, and especially on the bearing of the different facts upon his electrical theory of tornadoes.

Dr. Hare stated that he had not had his attention drawn to the meteor, until it had passed the zenith. But subsequently, seeing it distinctly from the top of his house, he had distinguished two clouds, one much above the other, between which there appeared to be an electrical reaction, tending to keep them at a distance, while the lower seemed to move from the southwest, and the upper one from the southeast. These features, together with the tremendous accompanying or preceding electrical discharges, as indicated by thunder and lightning, could not but demonstrate, in Dr. Hare's opinion, that electricity was the principal agent in the production of such phenomena. The fact mentioned in the public prints, that the iron chimney of a steamboat had been carried aloft, proved that a vertical force had been exerted; and the concentration of that force about a tall metallic cylinder was, Dr. Hare maintained, quite consistent with the idea, that the vertical force was the consequence of an electrical current, which would naturally concentrate the action about a prominent perfect conductor.

Dr. Hare could not reconcile the relative situation of the clouds, or their evident reaction and diversity of movement, with the theory of Mr. Espy.

The following gentlemen were duly elected members of the Society:—

Robert Were Fox, of Falmouth, England.
John Sanderson, of Philadelphia.
Francisco Martinez de la Rosa, of Madrid.
Major James D. Graham, U. S. Topographical Engineers.
J. B. B. Eyries, of Paris.